AMENDMENTS TO THE CLAIMS

1.   (Currently Amended) A patient positioning device for positioning a couch supporting a patient to which a charged particle beam is irradiated from a particle beam irradiation system, said patient positioning device comprising:

an X-ray emission device for emitting an X-ray;

an X-ray entry device for receiving the X-ray emitted from said X-ray emission device and outputting an output signal depending on the received X-ray;

an image information generator for generating second image information regarding a portion of the patient lying across the path of said particle beam by using the output signal outputted from said X-ray entry device; and

a processing unit for setting, with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and includes an isocenter, a first set area, wherein said first set area is smaller than an area of said first image information and includes ~~including an~~ said isocenter ~~with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including said isocenter~~, setting a second set area with respect to said second image information, wherein said second set area is smaller than an area of said second image information and includes ~~including~~ a position corresponding to the path of said charged particle beam ~~with respect to said second image information~~, and executing pattern matching between said first image information in said first set area and said second image information in said second set area by moving said second set area within said ~~an~~ area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, thereby producing information used for positioning of said couch based on said extracted ~~said~~ second set area.

2. (Original) A patient positioning device according to Claim 1, further comprising a couch controller for controlling movement of said couch in accordance with said positioning information.

3. (Original) A patient positioning device according to Claim 1, wherein said processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in said first set area and information of a plurality of pixels contained in the second image information in said second set area.

4. (Original) A patient positioning device according to Claim 3, wherein said processing unit produces said positioning information based on the least square method such that a deviation between the information of a plurality of pixels contained in the first image information in said first set area and the information of a plurality of pixels contained in the second image information in said second set area is minimized.

5. (Currently Amended) A patient positioning device for positioning a couch supporting a patient to which a charged particle beam is irradiated from a particle beam irradiation system, said patient positioning device comprising:

an X-ray emission device;

an image information generator for generating second image information regarding a portion of the patient lying across the path of said charged particle beam by using a signal depending on the X-ray emitted from said X-ray emission device;

a display unit for displaying first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and includes an ~~including a~~ isocenter, and the second image information; and

a processing unit for setting a first set area <u>with respect to said first image information, wherein said first set area is smaller than an area of said first image information and includes said</u> ~~including the~~ isocenter ~~with respect to the first image~~

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~~information~~, setting a second set area <u>with respect to said second image information,</u> <u>wherein said second set area is smaller than an area of said second image information</u> <u>and includes</u> ~~including~~ a position corresponding to the path of said charged particle beam ~~with respect to the second image information~~, displaying a frame showing said first set area and a frame showing said second set area on said display unit, and executing pattern matching between the first image information in said first set area and the second image information in said second set area <u>by moving said second set area</u> within an area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, thereby producing information used for positioning of said couch based on said extracted ~~said~~ second set area.

6.   (Original)   A patient positioning device according to Claim 5, wherein said display unit comprises a first display unit for displaying the first image information and a second display unit for displaying the second image information, said second display unit being separate from said first display unit.

7.   (Original)   A patient positioning device according to Claim 5, wherein said image information generator comprises an X-ray transducer for converting the incident X-ray into light, and a camera for capturing the light and producing the second image information.

8.   (Original)   A patient positioning device according to Claim 5, wherein said image information generator comprises a plurality of semiconductor radiation detectors for converting the incident X-ray into electrical signals, a plurality of signal processors disposed in a one-to-one relation to said semiconductor radiation detectors and processing said electrical signals, and an image information producing unit for receiving outputs from said signal processors and producing the second image information.

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9. (Original) A patient positioning device according to Claim 5, wherein said processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in said first set area and information of a plurality of pixels contained in the second image information in said second set area.

10. (Original) A patient positioning device according to Claim 9, wherein said processing unit produces said positioning information based on the least square method such that a deviation between the information of a plurality of pixels contained in the first image information in said first set area and the information of a plurality of pixels contained in the second image information in said second set area is minimized.

11. (Currently Amended) A patient positioning device for positioning a couch supporting a patient to which a charged particle beam is irradiated from a particle beam irradiation system, said patient positioning device comprising:

an X-ray emission device;

an image information generator for generating second image information regarding a portion of the patient lying across the path of said charged particle beam by using a signal depending on the X-ray emitted from said X-ray emission device; and

a processing unit for setting, with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and includes an isocenter, a first set area, wherein said first set area is smaller than an area of said first image information and includes said ~~including an~~ isocenter ~~with respect to first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including the isocenter~~, setting, with respect to the second image information, a second set area, wherein said second set area is smaller than an area of said second image information, has ~~having~~ substantially the same size as said first set area, and ~~including~~

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includes a position corresponding to the path of said charged particle beam, executing primary pattern matching between the first image information in said first set area and the second image information in said second set area by moving said second set area within said an area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, and executing secondary pattern matching between the first image information in said first set area and the second image information in said extracted second set area by moving the second image information in said extracted second set area relative to the first image information in said first set area, thereby producing information used for positioning of said couch.

12.   (Original)   A patient positioning device according to Claim 11, further comprising a couch controller for controlling movement of said couch in accordance with said positioning information.

13.   (Original)   A patient positioning device according to Claim 11, wherein said processing unit executes the pattern matching by using information of a plurality of pixels contained in the first image information in said first set area and information of a plurality of pixels contained in the second image information in said second set area.

14.   (Original)   A patient positioning device according to Claim 13, wherein said processing unit produces said positioning information based on the least square method such that a deviation between the information of a plurality of pixels contained in the first image information in said first set area and the information of a plurality of pixels contained in the second image information in said second set area is minimized.

15.   (Currently Amended) A patient positioning device according to Claim 11, further comprising a display unit for displaying at least the first

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image information in said first set area and at least the second image
information in said second set area,

wherein said processing unit displays said a frame showing said first set area and
said a frame showing said second set area on said display unit.

16.   (Original)   A patient positioning device according to Claim 11, wherein
said display unit comprises a first display unit for displaying the first image information
and a second display unit for displaying the second image information, said second
display unit being separate from said first display unit.

17.   (Currently Amended) A patient positioning method for positioning a
couch supporting a patient to which a charged particle beam is irradiated from a
particle beam irradiation system, said patient positioning method comprising the steps
of:

generating, based on the X-ray having penetrated a portion of the patient lying
across the path of said charged particle beam, second image information regarding the
portion of the patient;

taking, into a processing unit, first image information which serves as a reference
image prepared beforehand based on image data of the tumor in the body of the patient
and including the an isocenter;

taking second image information into said processing unit; and

setting, by utilizing said processing unit, a first set area with respect to a first
image information, wherein said first set area is smaller than an area of said first image
information and includes said including an isocenter with respect to a first image
information, setting a second set area with respect to said second image information,
wherein said second set area is smaller than an area of said second image information
and includes including a position corresponding to the path of said charged particle
beam with respect to said second image information, and executing, by utilizing said
processing unit, pattern matching between said first image information in said first set

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area and said second image information in said second set area <u>by moving said second set area</u> within <u>said</u> ~~an~~ area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, thereby producing information used for positioning of said couch based on said extracted ~~said~~ second set area.

18. (Currently Amended) A patient positioning method for positioning a couch supporting a patient to which a charged particle beam is irradiated from a particle beam irradiation system, said patient positioning method comprising the steps of:

generating, based on the X-ray having penetrated a portion of the patient lying across the path of said charged particle beam, second image information regarding the portion of the patient;

setting, <u>with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and includes an isocenter,</u> a first set area<u>, wherein said first set area is smaller than an area of said first image information and includes said</u> ~~including an~~ isocenter ~~with respect to first image information which serves as a reference image prepared beforehand based on image data of the tumor in the body of the patient and [serving as a reference] including the isocenter~~;

setting, with respect to the second image information, a second set area<u>, wherein the second set area is smaller than said second image information, has</u> ~~having~~ substantially the same size as said first set area<u>,</u> and <u>includes</u> ~~including~~ a position corresponding to the path of said charged particle beam;

executing primary pattern matching between the first image information in said first set area and the second image information in said second set area <u>by moving said second set area</u> within <u>said</u> ~~an~~ area of said second image information to extract said

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second set area having said second image information most similar to said first image information in said first set area; and

executing secondary pattern matching between the first image information in said first set area and the second image information in said extracted second set area <u>by moving the second image information in said extracted second set area relative to the first image information in said first set area</u>, thereby producing information used for positioning of said couch.

19.   (Original)   A patient positioning device according to Claim 1, wherein said X-ray emission device is mounted to said particle beam irradiation system and movable between a first position located in a path of said charged particle beam and a second position located away from the path of said charged particle beam to be out of interference with advance of said charged particle beam, and configured to emit an X-ray in said first position.

20.   (Currently Amended) A particle beam treatment system comprising:

a particle beam generator;

a particle beam irradiation system for irradiating a charged particle beam supplied by said particle beam generator to a tumor of a patient;

a couch for supporting said patient;

a patient positioning device comprising an X-ray emission device for emitting an X-ray, an X-ray entry device for receiving the X-ray emitted from said X-ray emission device and outputting an output signal depending on the received X-ray, an image information generator for generating second image information regarding a portion of the patient lying across the path of said particle beam by using the output signal outputted from said X-ray entry device, and a processing unit for setting<u>, with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and includes an isocenter,</u> a first set

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area, wherein the said first set area is smaller than an area of said first image information and includes ~~including~~ an isocenter ~~with respect to a first image information which serves as a reference image prepared beforehand based on image data of a tumor in the body of the patient and including said isocenter~~, setting a second set area with respect to said second image information, wherein said second set area is smaller than an area of said second image information and includes ~~including~~ a position corresponding to the path of said charged particle beam ~~with respect to said second image information~~, and executing pattern matching between said first image information in said first set area and said second image information in said second set area by moving said second area within said ~~an~~ area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, thereby producing information used for positioning of said couch based on said extracted said second set area;

a couch controller for controlling movement of said couch in accordance with said positioning information; and

a couch driver for moving said couch based on said couch controller.

21.　　(Canceled)

22.　　(Currently Amended) A patient positioning method for positioning a couch supporting a patient to which a charged particle beam is irradiated from a particle beam irradiation system, said patient positioning method comprising the steps of:

generating, based on the X-ray having penetrated a portion of the patient lying across the path of said charged particle beam, second image information regarding the portion of the patient;

taking, into a processing unit, first image information which serves as a reference image prepared beforehand based on image data of the tumor in the body of the patient and including an ~~the~~ isocenter;

taking second image information into said processing unit; and

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setting, by utilizing said processing unit, a first set area <u>with respect to said first</u> <u>image information, wherein said first set area is smaller than an area of said first image</u> <u>information and includes</u> ~~including~~ an isocenter ~~with respect to a first image~~ ~~information~~, setting a second set area <u>with respect to said second image information,</u> <u>wherein said second set area is smaller than an area of said second image information</u> <u>and includes</u> ~~including~~ a position corresponding to the path of said charged particle beam ~~with respect to said second image information~~, displaying a frame showing said first set area and a frame showing said second set area on said display unit, and executing, by utilizing said processing unit, pattern matching between said first image information in said first set area and said second image information in said second set area <u>by moving said second set area</u> within <u>said</u> ~~an~~ area of said second image information to extract said second set area having said second image information most similar to said first image information in said first set area, thereby producing information used for positioning of said couch based on said extracted ~~said~~ second set area.